



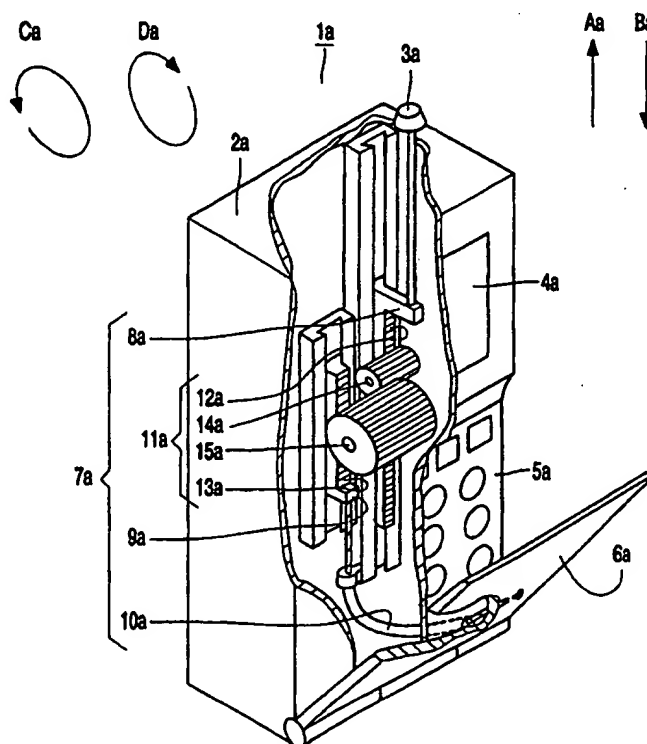
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>7</sup> : H01Q 1/24, H04B 1/38, H04M 1/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 00/21155 (43) International Publication Date: 13 April 2000 (13.04.00)</p>
<p>(21) International Application Number: PCT/EP99/07485 (22) International Filing Date: 30 September 1999 (30.09.99) (30) Priority Data: 10/294678 2 October 1998 (02.10.98) JP (71) Applicant (for all designated States except US): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). (72) Inventor; and (75) Inventor/Applicant (for US only): CHIKANO, Ichiro [JP/NL]; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). (74) Agent: DEGUELLE, Wilhelmus, H., G.; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).</p>		<p>(81) Designated States: CN, KR, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>

(54) Title: PORTABLE TELEPHONE SET

## (57) Abstract

To obtain a portable telephone set with which it is easy to elongate and store away an antenna. A portable telephone set comprises a main body, an antenna (3a) appended to the main body so as to be extendible or collapsible with respect to the main body, a control panel (5a) mounted on an external surface of the main body, control means (20) for extending the antenna from the main body when the control panel is operated to set up a call, and storing the antenna into the main body when the control panel is operated to terminate a call; and driving means (7) for extending or collapsing the antenna from or into the main body under the control of the control means.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon	KR	Republic of Korea	PL	Poland		
CN	China	KZ	Kazakhstan	PT	Portugal		
CU	Cuba	LC	Saint Lucia	RO	Romania		
CZ	Czech Republic	LI	Liechtenstein	RU	Russian Federation		
DE	Germany	LK	Sri Lanka	SD	Sudan		
DK	Denmark	LR	Liberia	SE	Sweden		
EE	Estonia			SG	Singapore		

Portable telephone set.

The present invention relates to a portable telephone set, and particularly to a portable telephone set having an antenna appended to a main body such that it can be extended and collapsed with respect to the main body.

5 In portable telephones, a number of antennae used for transmission/reception are appended to a main body such that they can be extended and collapsed with respect to the main bodies.

In a portable telephone set of such type, a user extends the antenna by pulling it from the main body or collapse it by pushing it into the main body, by his/her one hand, while holding the main body by the other hand.

10 As described above, the extension and collapse of the antenna require manipulation by using both hands. If one of the hands is used for another purpose, the extension/collapse operation cannot be sufficiently performed.

Further, although it is possible to make a call without extending the antenna from the main body, a radiowave with sufficient intensity might not be sent, or sufficiently  
15 high reception sensitivity might not be obtained.

Further, if the antenna is not collapsed into the main body after the termination of call, the antenna may be easily damaged.

The present invention has been made to solve the above problems, and has its object to realize a portable telephone set with an antenna which can be easily extended and  
20 collapsed.

Accordingly, the invention as means of solving the problems will be as described bellow.

(1) The invention in claim 1 is a portable telephone set comprising a main body, an antenna appended to the main body so as to be extendible or collapsible with respect to the main body,  
25 and a control panel mounted on an external surface of the main body, wherein when a call is set up via operation of the control panel, the antenna is extended from the main body, and when the call is terminated via operation of the control panel, the antenna is collapsed into the main body.

In the portable telephone set according to the above invention, when an operation is made via the control panel to start a call, the antenna is extended from the main body, and when an operation is made via the control panel to terminate the call, the antenna is collapsed into the main body. Even if the user cannot use both hands, he/she can easily extend and collapse the antenna.

- (2) The invention in claim 2 is a portable telephone set comprising a main body, an antenna appended to the main body so as to be extendible or collapsible with respect to the main body, and a control panel mounted on an external surface of the main body, which comprises: control means for detecting an operation state of the control panel, extending the antenna from the main body when the control panel is operated to set up a call, and storing the antenna into the main body when the control panel is operated to terminate a call; and driving means for extending or collapsing the antenna from or into the main body under the control of the control means.

In the portable telephone set according to the above invention, the control means extends the antenna from the main body when an operation is made via the control panel to start a call, and the control means collapses the antenna into the main body when an operation is made via the control panel to terminate the call. The driving means performs driving based on the control of the control means. Even if the user cannot use both hands, he/she can easily extend and collapse the antenna.

- (3) The invention in claim 3 is a portable telephone set comprising a main body, an antenna appended to the main body so as to be extendible or collapsible with respect to the main body, and a covering body to cover a control panel mounted on an external surface of the main body, whose feature is that: when the covering body covers the control panel, the antenna is collapsed into the main body, and when the covering body is removed from the control panel, the antenna is extended from the main body.

In the portable telephone set according to the above invention, the antenna is extended from the main body when the covering body covers the control panel, while the antenna is collapsed into the main body when the covering body is removed from the control panel. By the extension and collapse operations as above, even if the user cannot use both hands, he/she can easily extend and collapse the antenna.

- (4) The invention in claim 4 is the portable telephone set as described in claim 3 comprising: a first slider connected to the antenna; a wire connected to the covering body which is rotatably mounted to the main body; a second slider connected to the wire; and sliding movement

transmitting means, placed between the first and second sliders, causing the sliders to move in opposite directions and transmitting therewith a sliding movement.

In the portable telephone set according to the above invention, the wire and the transmitting means transmit the movement of the covering body to the antenna connected to the slider means, which realizes the extension and collapse of the antenna.

By the extension and collapse operations as above, even if the user cannot use both hands, he/she can easily extend and collapse the antenna.

Next, a first embodiment of the present invention will be described with reference to the drawings.

Fig. 1 is a block diagram showing the construction relating to antenna driving in a portable telephone set according to a first embodiment of the present invention. In Fig. 1, reference numeral 2a denotes a main body of the portable telephone set; 3a, an antenna element (hereinafter, simply referred to as an "antenna"); 3b, a stopper provided under the antenna; 3c and 3d, reflectors indicating predetermined positions; 5a, a control panel having various keys; 7, a driver to extend/collapse the antenna 3a; 20, a CPU as control means for controlling the respective parts of the portable telephone set; 21, an antenna case for holding the antenna 3a; 22, a photocoupler for detecting an extended position and a collapsed position of the antenna 3a by using the reflectors 3c and 3d.

Note that the control panel 5a has a call button to start a call, a hang-up button to terminate a call, ten keys and the like. Further, the driver 7 comprises an ultrasonic motor, a combination of a spindle motor and a drive gear or the like to drive the antenna 3a.

Note that if the driver 7 comprises an ultrasonic motor, a driving surface of the ultrasonic motor is set along the element of the antenna 3a.

Further, if the driver 7 comprises a spindle motor and a worm gear, the driver has a construction as shown in Fig. 2. Fig. 2(a) shows a cross section of the driver 7. Fig. 2(b) shows a front view of the driver 7.

In Fig. 2, a worm 72 rotates by a rotation shaft 71 of a motor 70. By the rotation of the worm 72, a gear 73 constructing a worm wheel having an axis in a direction orthogonal to the axis of the worm 72 rotates. Further, a gear 75 engaged with the gear 73 rotates in a direction opposite to a rotational direction of the gear 73. Note that Fig. 2(b) does not show a portion where the gear 73 and the gear 75 engage with each other since the portion is on the rear of the antenna 3a.

Then, a roller 74 coaxial with respect to the gear 73 and the roller 76 coaxial with respect to the gear 75 rotate in the rotational directions of the respective gears. The roller 74 and the roller 76 rotate in opposite directions, and the antenna 3a held between these two rollers is driven in an extending or collapsing direction. A friction force necessary for driving the antenna and slip necessary for manual extension/collapse on the antenna 3a directly made by the user can be obtained by forming the rollers 74 and 76 with elastic material.

Next, the operation of the portable telephone set of the present embodiment will be described with reference to a flowchart of Fig. 3. Note that the flowchart of Fig. 3 shows a subroutine to perform antenna extension/collapse processing, called at predetermined timing.

10 The CPU 20 monitors the control panel 5a, waiting for depression of the call button on the control panel 5a upon reception of incoming call (call operation made to an incoming-call), or depression of the call button on the control panel 5a upon call origination (call operation made for call origination) (S1 and S3 in Fig. 3).

15 If a key code indicative of depression of the call button is outputted from the control panel 5a by an incoming or call-origination operation (YES at S1 or S2 in Fig. 3), the CPU 20 performs antenna extension processing (S3 in Fig. 3).

In the antenna extension processing, the CPU 20 provides an antenna extension command to the driver 7. The driver 7 that receives the antenna extension command drives the antenna 3a in a direction Aa by rotation of an ultrasonic motor (not shown) or the motor 70 in Fig. 2.

20 At this time, when the photocoupler 22 detects the reflector 3c, the CPU 20 provides a drive stop command to the driver 7. The driver 7 stops the antenna extension operation. In this case, as a stop torque has occurred at the antenna 3a by contact with the ultrasonic motor (not shown) or holding by the rollers 74 and 76, the antenna 3a does not return to the collapsing direction by gravity or the like.

25 Further, when the CPU 20 detects that the user has terminated communication and depressed the hang-up button (YES at S4 in Fig. 3), the CPU performs antenna collapse processing (S5 in Fig. 3).

In the antenna collapse processing, the CPU 20 provides an antenna collapse command to the driver 7. The driver 7 that receives the antenna collapse command drives the antenna 3a in a direction Ba by rotation of the ultrasonic motor (not shown) or the motor 70 in Fig. 2.

30 At this time, when the photocoupler 22 detects the reflector 3d, the CPU 20 provides a drive stop command to the driver 7. The driver 7 stops the antenna collapse

operation. In this case, as a stop torque has occurred at the antenna 3a by contact with the ultrasonic motor (not shown) or holding by the rollers 74 and 76 in Fig. 2, the antenna 3a does not return in the extended direction by gravity or the like.

As described above, the antenna 3a automatically extends or collapses  
5 interlocked with normal call operation or call termination operation. Accordingly, even if the user cannot use both hands, he/she can easily extend and collapse the antenna. This solves the problem of reduction of sensitivity in communication or the like. Further, damage to the antenna in a case where the user forgot to collapse the antenna can be prevented.

Further, as the rollers holding the antenna have appropriate slip, the antenna 3a  
10 can be manually extended or collapsed as in the case of conventional art. Further, such slip can prevent damage to the antenna 3a or the gears even if the antenna 3a hits some obstacle upon extension or collapse operation.

Further, in the above description, the antenna extension operation and collapse  
15 operation are stopped based on the result of detection by the photocoupler 22, however, the operations may be stopped after they are continued for a predetermined period. Further, it may be arranged such that a current consumed at the motor is monitored, and when an excessive current flows, the operation is stopped or driving in an opposite direction is made. Note that if such operations are employed, the photocoupler 22 may be omitted.

Further, it may be arranged such that a sensor to detect peripheral brightness is  
20 provided, and if the brightness is at a predetermined level upon reception of incoming call, the antenna is extended without waiting for the depression of the call button. In this case, if the brightness has a predetermined or less value, as the portable telephone set is held in a bag or the like, the antenna is not extended. Accordingly, if the brightness has a predetermined or less value upon reception of incoming call, the antenna is extended by depression of the call  
25 button.

Further, if a call has been originated but the line has been busy and the call  
origination is made again, the hang-up button must be depressed before the second call origination. That is, even when the user knows the line is busy and depresses the hang-up button, if call origination is made immediately, it is not necessary to collapse the antenna.  
30 Accordingly, if the line is busy and the hang-up button is depressed, the CPU 20 delays the antenna collapse. By this arrangement, if call origination is made immediately after the depression of the hang-up button, call origination can be made in a status where the antenna is still extended. Further, if call origination is not made soon, the antenna is collapsed after a

predetermined number of seconds. Note that the CPU 20 may perform similar processing in a case where communication is terminated due to deterioration of radiowave conditions.

Note that in the above-described embodiment, the motor 70 employed in the driver 7 may be also used as a vibrator upon incoming call. In this case, the slight extension and collapse of the antenna 3a are repeated by repeating forward rotation and reverse rotation of the motor 70 at short periods, and vibration similar to that caused by a vibrator can be produced. This can omit a motor only for the vibrator.

Next, a second embodiment of the present invention will be described with reference to the drawings.

10 A portable telephone set 1a has a main body 2a, an antenna 3a, a display panel 4a, a control panel 5a and a covering body 6a as shown in Fig. 4.

The main body 2a has an approximately rectangular parallelepiped shape. The antenna 3a is appended to the main body 2a such that it can extend (slide in an arrow Aa direction) and collapse (slide in an arrow Ba direction) from a top surface of the main body 2a with respect to the main body 2a.

The display panel 4a and the operation panel 5a are provided on an upper part and a lower part of a front surface of the main body 2a.

The covering body 6a covers and protects the control panel 5a provided outside the front surface lower part of the main body 2a. The covering body 6a is pivotally supported at a lower end of the front surface of the main body 2a, and is rotatable with respect to the main body 2a (in arrow Ca and arrow Da directions).

The portable telephone set 1a has driving means 7a which collapses the antenna 3a into the main body 2a when the covering body 6a is rotated in the arrow Ca direction to cover the control panel 5a, while extends the antenna 3a from the main body 2a when the covering body 6a is rotated in the arrow Da direction to release the covered state of the control panel 5a.

That is, the portable telephone set 1a has sliders 8a and 9a having sliding directions provided in extending and collapsing directions of the antenna 3a, as the driving means 7a, and a wire 10a for force transmission and transmitting means 11a.

30 The slider 8a is held by a guide 12 fixed on the inner wall side of the main body 2, and slides in the arrow Aa and arrow Ba directions. The antenna 3a is fixed and held on an upper surface of the slider 8a.

The slider 9a is held by the guide 12 fixed on the inner wall side of the main body 2, and slides in the arrow Aa and arrow Ba directions. One end of the wire 10a is fixed and held on a bottom surface of the slider 9a.

The other end of the wire 10a is connected to the covering body 6a.

- 5 Accordingly, when the covering body 6a is rotated in the arrow Ca or Da directions, transmits the forces of the rotation to slide the slider 9a in the arrow Aa and arrow Ba directions.

The transmitting means 11a causes the slider 8a and the slider 9a to move in opposite sliding directions and transmits a sliding movement.

- 10 The transmitting means 11a mainly comprises a rack gear 12a and a rack gear 13a respectively formed on the sliders 8a and the slider 9a, a pinion gear 14a and a pinion gear 15a, respectively engaged with the rack gears 12a and the rack gears 13a, and further, engage with each other.

Note that the ratio between the number of teeth of the pinion gear 14a and that of the pinion gear 15a is approximately 1 to 2.5.

- 15 The portable telephone set 1a has the above construction. Hereinbelow, the operation of the portable telephone set 1a will be described with the driving means 7a as the main part.

- When the user uses the portable telephone 1a, the user holds the main body 2a in his/her hand, and rotates the covering body 6a in the arrow Da direction with respect to the main body 2a to release the covered state of the operation panel 5a. The covering body 6a rotated in the arrow Da direction slides the slider 9a in the arrow Ba direction via the wire 10a.

The slider 9a slid in the arrow Ba direction rotates the pinion gear 15a in the arrow Ca direction.

- 25 The pinion gear 15a rotated in the arrow Ca direction rotates the pinion gear 14a in the arrow Da direction at an angular velocity in correspondence with the gear ratio.

The pinion gear 14a rotated in the arrow Da direction slides the slider 8a in the arrow Aa direction.

- 30 Accordingly, the antenna 3a fixed and held on the upper surface of the slider 8a slides with the slider 8a slid in the arrow Aa direction. As a result, the antenna 3a is extended with respect to the main body 2a from the collapsed state.

The user can use the portable telephone set 1a with the antenna 3a in the extended state with respect to the main body 2a.

On the other hand, when the user finishes the use of the portable telephone set 1a, he/she rotates the covering body 6a in the arrow Ca direction with respect to the main body 2a, to set the control panel 5a in the covered state.

5 The covering body 6a rotated in the arrow Ca direction slides the slider 9a in the arrow Aa direction via the wire 10a.

The slider 9a slid in the arrow Aa direction rotates the pinion gear 15a in the arrow Da direction.

The pinion gear 15a rotated in the arrow Da direction rotates the pinion gear 14a in the arrow Ca direction at an angular velocity in correspondence with the gear ratio.

10 The pinion gear 14a rotated in the arrow Ca direction slides the slider 8a in the arrow Ba direction.

Accordingly, the antenna 3a fixed and held on the upper surface of the slider 8a slides with the slider 8a in the arrow Ba direction. As a result, the antenna 3a is set to the collapsed state from extended state with respect to the main body 2a.

15 The user can put the portable telephone set 1a with the antenna 3a in the collapsed state with respect to the main body 2a in a bag or the like and bring it with him/her.

Note that in the portable telephone set 1a, the antenna 3a is extended and collapsed by operating the covering body 6a in the above-described use, however, the covering body 6a can be opened and closed by operating the antenna 3a.

20 As described above, as the antenna 3a is extended or collapsed interlocked with the operation of the covering body upon call, even if the user cannot use both hands, the antenna can be easily extended or collapsed. Accordingly, the reduction of sensitivity upon communication can be solved. Further, damage to the antenna in a case where the user forgot to collapse the antenna can be prevented.

25 As described in detail above, the invention of the portable telephone set described in the specification attains the following effects.

(1) As the antenna automatically extends or collapses interlocked with general call operation or call termination operation, even if a user cannot use both hands, he/she can easily extend and collapse the antenna. Accordingly, the problem of the reduction of sensitivity upon communication can be solved. Further, damage to the antenna in a case where the user forgot to collapse the antenna can be prevented.

30 (2) As the antenna 3a automatically extends or collapses interlocked with the operation of the covering body upon communication, even if a user cannot use both hands, he/she can easily extend and collapse the antenna. Accordingly, the problem of the reduction of sensitivity upon

communication can be solved. Further, damage to the antenna in a case where the user forgot to collapse the antenna can be prevented.

Fig. 1 is a block diagram showing the construction of principal elements of the portable telephone set according to the first embodiment of the present invention.

5 Fig. 2 are diagrams showing the structure of the antenna driver of the portable telephone set according to the first embodiment of the present invention.

Fig. 3 is a flowchart showing the operation of the portable telephone set according to the first embodiment of the present invention.

10 Fig. 4 is a partial cut-away perspective view showing the structure of the principal elements of the portable telephone set according to the second embodiment of the present invention.

## Description of Reference Numerals

	1a	portable telephone set
5	2a	main body
	3a	antenna
	5a	control panel
	6a	covering body
	7a	driving means
10	8a, 9a,	slider
	10a	wire
	11a	transmitting means
	20	CPU
	21	antenna case
15	22	photocoupler

## CLAIMS:

1. A portable telephone set comprising a main body, an antenna appended to the main body so as to be protruded from or stored into the main body, and a control panel mounted on an external surface of the body wherein each time call is set up via operation of the control panel, the antenna is protruded from the main body, and each time call is terminated via operation of the control panel, the antenna is stored into the main body.
2. A portable telephone set comprising a main body, an antenna appended to the main body so as to be extendible or collapsible with respect to the main body, and a control panel mounted on an external surface of the main body, which comprises: control means for detecting an operation state of the control panel, extending the antenna from the main body when the control panel is operated to set up a call, and storing the antenna into the main body when the control panel is operated to terminate a call; and driving means for extending or collapsing the antenna from or into the main body under the control of the control means.
3. A portable telephone set comprising a main body, an antenna appended to the main body so as to be extendible or collapsible with respect to the main body, and a covering body to cover a control panel mounted on an external surface of the main body, whose feature is that: when the covering body covers the control panel, the antenna is collapsed into the main body, and when the covering body is removed from the control panel, the antenna is extended from the main body.
4. A portable telephone set as claimed in claim 3 comprising: a first slider connected to the antenna; a wire connected to the covering body which is rotatably mounted to the main body; a second slider connected to the wire; and sliding movement transmitting means, placed between the first and second sliders, causing the sliders to move in opposite directions and transmitting therewith a sliding movement.

1/4

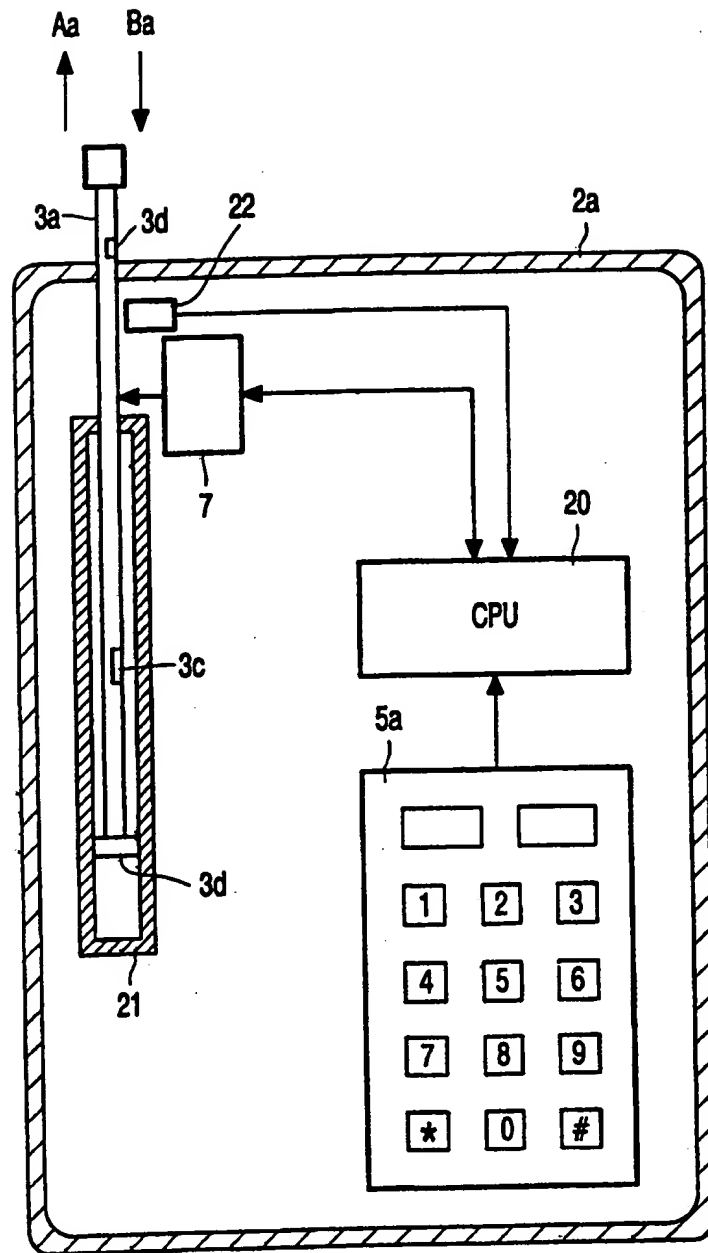


FIG. 1

2/4

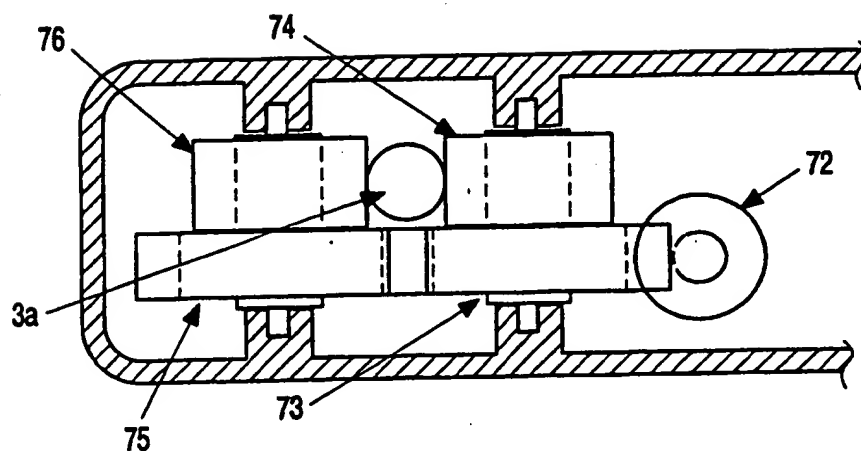


FIG. 2a

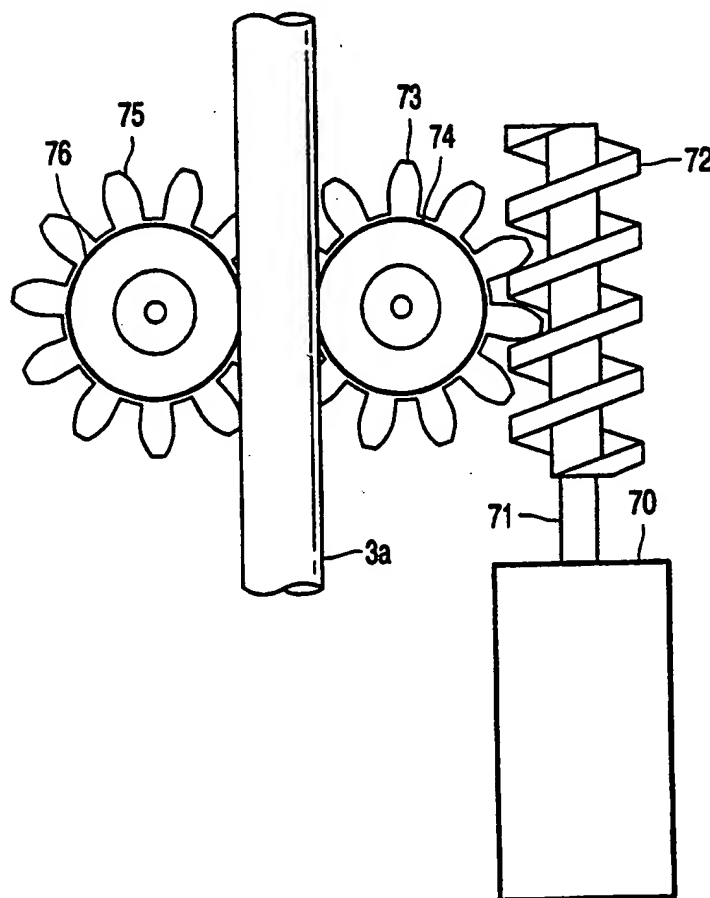


FIG. 2b

3/4

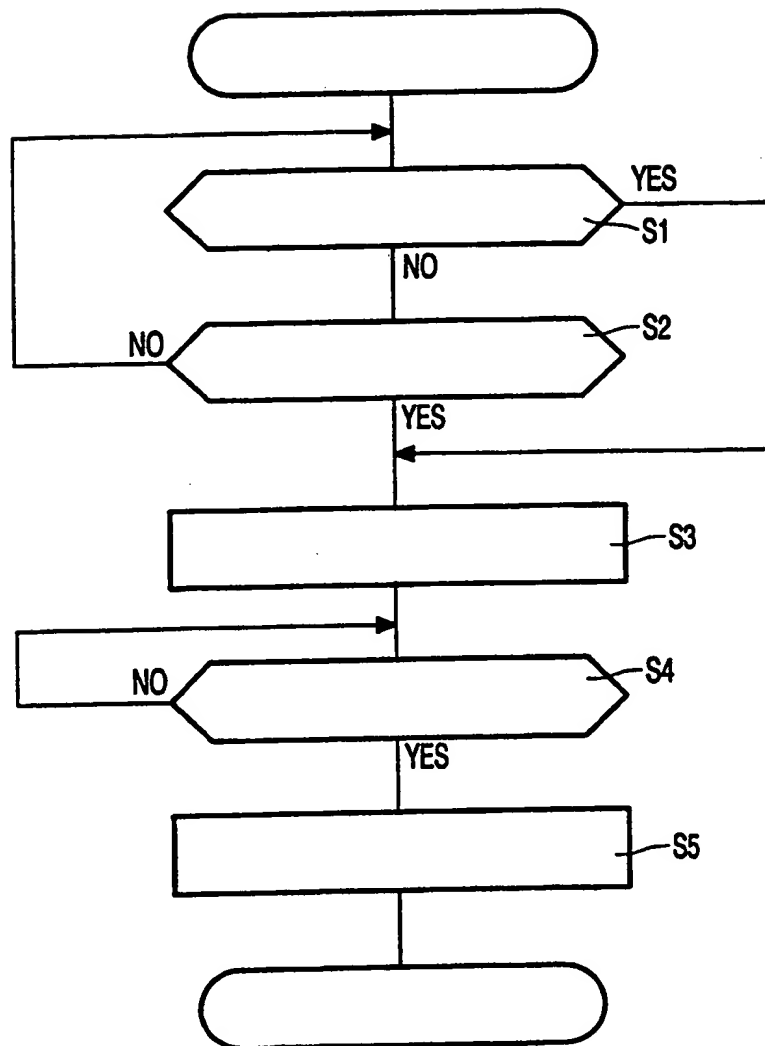


FIG. 3

4/4

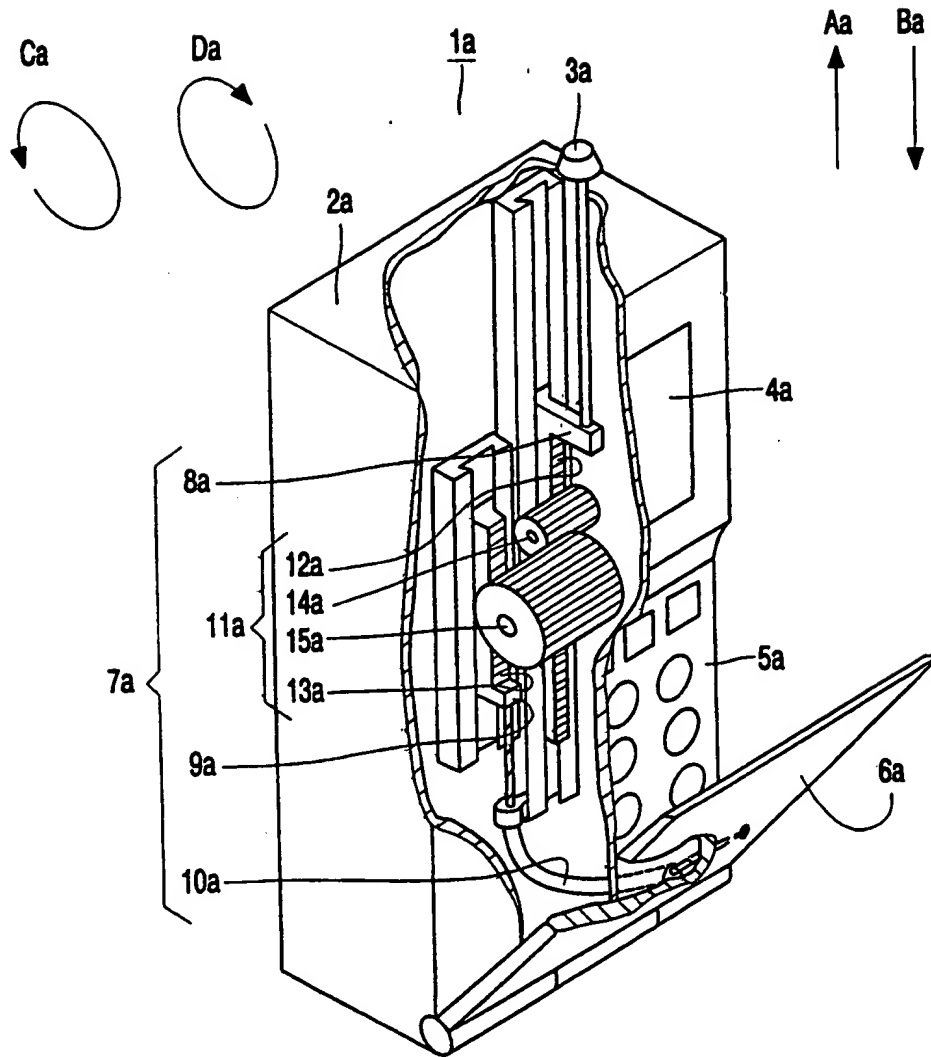


FIG. 4

# INTERNATIONAL SEARCH REPORT

Int. .ional Application No

PCT/EP 99/07485

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01Q1/24 H04B1/38 H04M1/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01Q H04B H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 691 147 A (SAMSUNG ELECTRONICS CO LTD) 7 May 1998 (1998-05-07) -& GB 2 329 760 A (SAMSUNG ELECTRONICS CO LTD) 31 March 1999 (1999-03-31) abstract; claims 1,15; figure 15 ---	1-3
X	US 5 497 506 A (TAKEYASU SHINJI) 5 March 1996 (1996-03-05) the whole document ---	1,2
X	EP 0 800 227 A (NIPPON ELECTRIC CO) 8 October 1997 (1997-10-08) column 12, line 1-29; figure 8 ---	1,2
X	EP 0 661 825 A (NIPPON ELECTRIC CO) 5 July 1995 (1995-07-05) the whole document ---	3
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

21 January 2000

Date of mailing of the international search report

04/02/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Van Dooren, G

# INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/EP 99/07485

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 703 691 A (NIPPON ELECTRIC CO) 27 March 1996 (1996-03-27) column 4, line 50 -column 5, line 49; figures 1,2 ---	3
X	US 5 166 695 A (TAN HER S ET AL) 24 November 1992 (1992-11-24) claims 1,14 ---	3,4
A	US 5 448 251 A (GERSZBERG IRWIN ET AL) 5 September 1995 (1995-09-05) claim 1 -----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 99/07485

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
AU 691147	A	07-05-1998	BR 9705708 A	30-03-1999
			CA 2219760 A	30-03-1999
			CN 1213192 A	07-04-1999
			DE 19749253 A	01-04-1999
			FI 974077 A	31-03-1999
			FR 2769134 A	02-04-1999
			GB 2329760 A,B	31-03-1999
			IT T0970954 A	30-03-1999
			JP 11122014 A	30-04-1999
			SE 9704106 A	31-03-1999
US 5497506	A	05-03-1996	NONE	
EP 0800227	A	08-10-1997	JP 9270613 A	14-10-1997
			JP 2928160 B	03-08-1999
			JP 9321512 A	12-12-1997
			AU 1664797 A	09-10-1997
EP 0661825	A	05-07-1995	JP 2689881 B	10-12-1997
			JP 7203524 A	04-08-1995
			FI 946098 A	29-06-1995
			US 5630211 A	13-05-1997
EP 0703691	A	27-03-1996	JP 2658906 B	30-09-1997
			JP 8097891 A	12-04-1996
			AU 702077 B	11-02-1999
			AU 3280395 A	04-04-1996
			US 5706332 A	06-01-1998
US 5166695	A	24-11-1992	NONE	
US 5448251	A	05-09-1995	EP 0650282 A	26-04-1995
			JP 2868419 B	10-03-1999
			JP 7184253 A	21-07-1995